INSTRUCTION BOOK

for

VIBRATOR POWER SUPPLY NAVY TYPE CRF-20221-A

NAVSHIPS 900, 418-IB

RESTRICTED

{For Official Use Only}

MANUFACTURED

BY

THE RADIART CORPORATION

CLEVELAND, OHIO

FOR

U. S. NAVY DEPT. BUREAU OF SHIPS

Contract NXsr-23697
Contract NXsr-41027 *Approved 21 October, 1944*

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RECORD OF CORRECTIONS MADE

Change No.	Date	Signature of Officer Making Correction

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CONTRACTUAL GUARANTEE

The equipment, including all parts and spare parts except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of ONE YEAR from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b., any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the contractor's design or is of a design selected by the contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten per cent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred per cent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for effecting expeditious adjustment under the provisions of this contractual guarantee.

The above ONE YEAR period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the contractor will be guaranteed anew under this provision.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its service life, shall be made to the Bureau of Ships in accordance with current instructions. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures, see Chapter 67 of the "Bureau of Ships Manual," or superseding instructions.

INSTALLATION RECORD

Contract Numbers: NXsr-23697. Date of Contract: 12 February 1943
NXsr-41027. Date of Contract: 13 November 1943

Serial Number of Equipment .....
Date of Acceptance by the Navy .....
Date of Delivery to Contract Destination .....
Date of Completion of Installation .....
Date Placed in Service .....

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the equipment, using suitable methods and care to avoid damaging the equipment.

REPLACEMENT MATERIAL

All requests or requisitions for replacement material should include complete descriptive data covering the part desired, in the following form:

1. Name of Part Desired .....
2. Federal Stock Number (if assigned) .....
3. Navy Type Number (if assigned) (including ***prefix*** and ***suffix*** as applicable) .....
4. Commercial Designation .....
5. Model Designation (including suffix) of equipment in which used .....
6. Navy Type Designation (including ***prefix*** and ***suffix*** where applicable) of Major Unit in which part is used .....
7. Contract, Purchase Order, Requisition, etc., under which the equipment was procured .....
8. Circuit Symbol Designation of Part .....

9(a) Navy Drawing and/or Specification Number (include part or group number) .....

9(b) Manufacturer's Drawing and/or Specification Number (include part or group number) .....

10. Rating or Other Descriptive Data .....

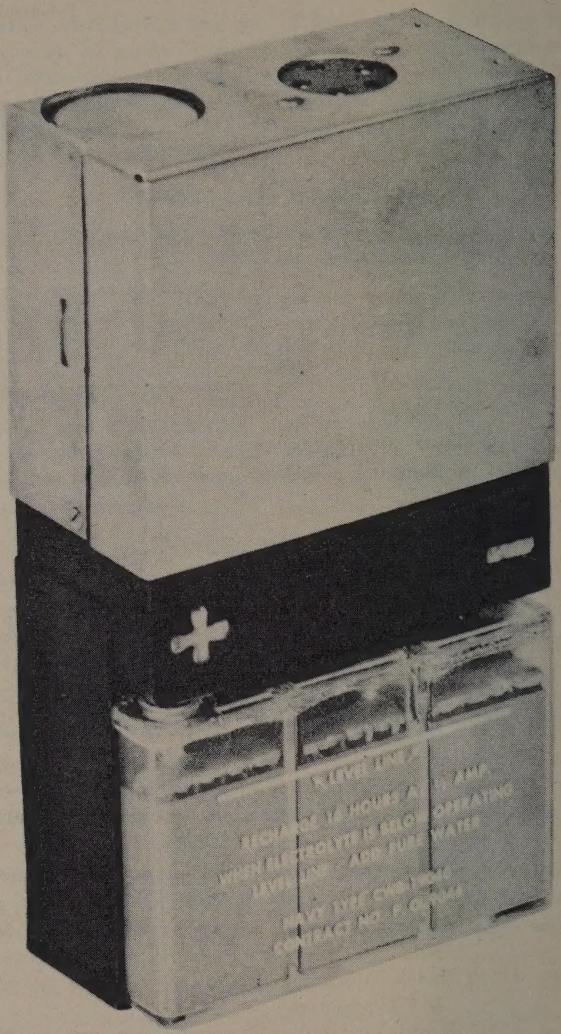


Figure 1-1

General View.

Navy Type CRF-20221-A Vibrator Power Supply with Navy Type CWB-19046 Battery in Place.

SECTION I
GENERAL DESCRIPTION

1. QUICK REFERENCE DATA.

(a) Nomenclature: Vibrator Power Supply, Navy Type CRF-20221-A.

(b) Contract Numbers and Dates: NXsr-23697 dated February 12, 1943 and NXsr-41027 dated November 13, 1943.

(c) Contractor: The Radiart Corporation, Cleveland, Ohio.

(d) Cognizant Naval Inspector: Inspector of Naval Material, Cleveland, Ohio.

(e) Input Voltage: 6 volts.

(f) Maximum Output Rating for Continuous Operation:

Voltage	Current
+ 1.5 volts	0.3 amp.
— 6 volts	0.02 amp.
+ 67.5 volts	0.005 amp.
+ 135 volts	0.02 amp.

2. INTENT OF DESIGN.

This vibrator power supply, in conjunction with a suitable six volt battery, furnishes all plate, screen, microphone, bias and filament voltages required for operating various portable radio transmitting and receiving equipments. The power supply is designed to provide maximum battery life and efficiency with minimum size and weight, and to provide a minimum of interference to transmitted and received intelligence.

The vibrator power supply will furnish all necessary power for operating the following equipments:

Type 43029 Radio Transmitter-Receiver. (A unit of Model MU Equipment)
Type 43030 Radio Transmitter-Receiver. (A unit of Model MV Equipment)
Type 43031 Radio Transmitter-Receiver. (A unit of Model MW Equipment)
Type 43032 Radio Transmitter-Receiver. (A unit of Model MX Equipment)
Type 43045 Radio Transmitter-Receiver. (A unit of Model MAB Equipment)

Type 43055 Radio Transmitter-Receiver. (A unit of Model DAV and DAV-1 Equipment)
Type 43063 Radio Transmitter-Receiver. (A unit of Model DAV-2 Equipment)

3. EQUIPMENT SUPPLIED.

Name of Unit	Navy Type Designation	Overall Dimensions	Volume	Weight
Vibrator Power Supply	CRF-20221-A	Height 6 9/16 in. Width 3 11/16 in. Depth 1 13/16 in.	28 cu. in.	1 lb. 13 oz.

4. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Name of Unit	Navy Type Designation	Overall Dimensions	Volume	Weight
Battery	CWB-19042	Height 2 3/8 in. Width 3 19/32 in. Depth 1 13/16 in.	15.5 cu. in.	1 lb. 5 oz.
		or		
Battery	CWB-19046	Height 2 3/8 in. Width 3 19/32 in. Depth 1 13/16 in.	15.5 cu. in.	1 lb. 5 oz.

5. DESCRIPTION OF MAJOR UNITS.

(a) VIBRATOR POWER SUPPLY.

The vibrator power supply is shown complete with battery in Figure 1-1. The supporting brackets on the side of the power supply hold the battery in place, but permit ready removal of the battery for replacement. Electrical connections to the battery are made through conducting springs which contact the battery terminals with correct polarity when the battery is properly inserted between the supporting brackets.

The power supply cover is removable to provide access to the majority of the components. A label containing the power supply schematic diagram is placed on the inside of this cover for use by servicing personnel.

The vibrator is a plug-in type and may be removed through an opening in the top of the power supply case without removing any of the housing covers. A five-prong socket in the top of the power supply unit is provided for connection to the radio equipment.

An R. F. shield, with necessary screws, is furnished with each power supply and is designed to fasten to the bottom of the radio

transmitter-receiver. The tongue of the R. F. shield fastens to the power supply, making both a mechanical and an electrical connection between the transmitter-receiver and power supply. This shield is intended for use on equipments in which the power supply compartment is not furnished with its own shield container.

(b) BATTERY.

Either of the two batteries listed in paragraph 4 may be used with the vibrator power supply. The Type CWB-19042 is a primary battery which must be discarded when discharged and replaced by a fresh battery. The Type CWB-19046 is a storage battery which may be recharged and used again.

The external case construction and terminal arrangements are the same for both battery types. The terminal contacts are flush with the top of the battery case, and are so placed that they will connect to the contact springs of the power supply when the battery is properly inserted between the supporting brackets. Two recesses are molded into the bottom of the battery case which engage the supporting brackets when the battery is properly inserted to insure correct polarity.

SECTION II
INSTALLATION AND OPERATION

1. GENERAL.

Preparation of this equipment for use is relatively simple. The procedure described in the paragraphs which follow should be closely adhered to.

2. BATTERY.

The first step in preparing the power supply for use is the installation of a fully charged battery. If a fully charged battery is not available and a new battery must be prepared for use, the instructions furnished with the battery should be followed. For convenience, the instructions for both battery types are repeated below.

CAUTION

DO NOT ALLOW BATTERY ACID TO COME IN CONTACT WITH SKIN, CLOTHING OR EQUIPMENT.

(a) INSTRUCTIONS FOR TYPE CWB-19042 BATTERY.

(1) Remove adhesive tape, disengaging the filling unit containing the acid from the battery.

(2) Place the filling unit on a flat surface with the three tips upright.

(3) With the sharp pointed tool furnished, puncture the three tips of the filling unit. (See Figure 2-1(A)).

(4) Place the battery upside down on the filling unit, with the holes in the battery engaging the tips of the filling unit.

(5) Holding the two units together, invert them so that the battery will be on the bottom with the filling unit above it.

(6) With the sharp pointed tool, puncture the three small covered holes in the bottom of the filling unit which is now exposed to view. (See Figure 2-1(B)).

(7) After the battery acid has drained from the filling unit, cover these three holes with a strip of adhesive tape to prevent acid leakage. Remove filling unit, and discard.

(8) Place the screw plugs and washers in the three holes on the top of the battery and tighten these plugs with the screw driver portion of the tool furnished with the battery. (See Figure 2-1(C)).

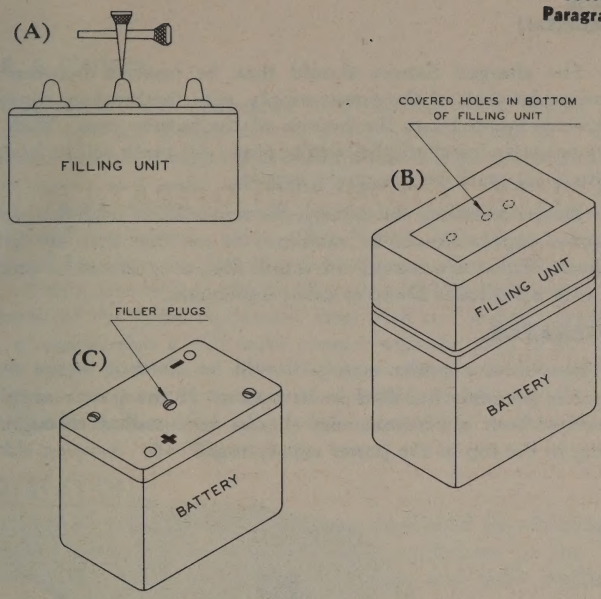


Figure 2-1
Preparation of Type CWB-19042 Battery. See Sec. 2, Par. 2.

(b) INSTRUCTIONS FOR TYPE CWB-19046 BATTERY.

(1) Remove and discard adhesive tape which seals vent holes.

(2) Add electrolyte through vent holes with the filling device provided. (Acid should be at least 60°F. for best results.)

(3) Fill slowly until liquid level reaches line marked "Initial filling level." This will require exactly one-third of the electrolyte supplied, in each cell. Levels will rise slightly for the first hour upon standing and may be lowered again by gently bumping or inverting the cell to release trapped gas. Any excess electrolyte above operating level line should be removed by means of the syringe to prevent pumping and acid leakage during use. Maintain at this operating level line by the use of distilled water only during subsequent service.

(4) The battery should stand for at least one hour before using and should be used within twelve hours after filling. The battery is shipped in a "dry charged" condition and should not require an initial charge after filling.

(c) The charged battery should then be inserted between the supporting brackets of the power supply, with the brackets engaging the recesses molded into the bottom of the battery case. With the battery properly installed, the battery plus (+) mark will be beneath the plus (+) mark on the power supply.

(d) Before installing the battery, the terminals of both the battery and power supply should be examined to see that they are bright and clean. If they are coated with a dull film, they should be scraped clean with a flat knife blade or other implement.

3. VIBRATOR.

The vibrator power supply should be checked to see that a vibrator is properly installed in its socket. If the power supply is received without a vibrator, one should be installed through the opening in the top of the power supply case.

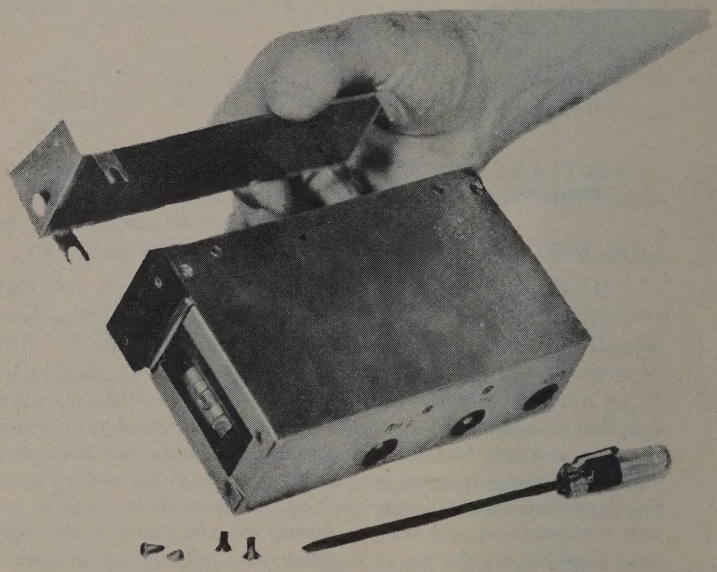


Figure 2-2

Installation of R. F. Shield on Radio Set. See Sec. 2, Par. 4.

4. R. F. SHIELD

For those radio equipments in which the power supply compartment does not contain its own shield container, the R. F. shield furnished with the vibrator power supply should be fastened to both power supply and radio transmitter-receiver. To fasten the R. F. shield to the transmitter-receiver equipment, loosen the four screws which hold the cover in place. (See Figure 2-2). Insert the four U-shaped lugs between the chassis and cover, then tighten screws. The vibrator power supply should be inserted in the proper compartment of the radio equipment case, with the socket oriented in such a manner that it will make contact with the plug in the cover of the radio case. Then insert the transmitter-receiver equipment into its compartment of the radio case, and fasten the tongue of the R. F. shield to the power supply by means of the screws provided for this purpose. (See Figure 2-3).

5. OPERATION.

Operation of the power supply is accomplished by actuating the "Off-On" switch of the associated radio equipment to the "On" position. This energizes both power supply and radio equipment. No adjustments are necessary.

Figure 2-3

Fastening Tongue of R. F. Shield to Power Supply. See Sec. 2, Par. 4.

SECTION III
THEORY OF OPERATION

1. GENERAL.

The vibrator power supply furnishes all voltages necessary to operate the transmitter-receiver, tabulated in paragraph 2, Section I, all properly filtered to prevent objectionable hum and radio interference. Filament power is obtained directly from the six volt primary battery through suitable dropping resistances and filter components; while plate, screen, bias and microphone power is obtained from a vibrator supply.

2. FILAMENT SUPPLY.

The 1.4 volt filament voltage is obtained directly from the six volt battery, with the coil of relay K-201 acting as the dropping resistance for the filament circuit, and capacitor C-203 as a filter condenser. When the "Off-On" switch of the radio equipment is operated to the "On" position, filament current passes through the coil of relay K-201, automatically regulating the filament voltage to its proper value, and simultaneously closing the relay and starting the vibrator Y-201.

3. PLATE AND BIAS SUPPLY.

The vibrator is of the split-reed synchronous type, operated at a frequency of approximately 180 cycles per second. The set of primary contacts of this vibrator converts the primary voltage from direct to alternating current. This low voltage alternating current is "stepped-up" to high voltage alternating current by transformer L-201, and the secondary contacts of the vibrator rectify this high voltage to direct current for the plate and screen supply. Condenser C-207 across the secondary winding of transformer L-201 acts as the buffer. The high voltage D.C. is filtered by audio choke L-202 and filter condensers C-204 and C-205. The screen voltage is obtained from the plate supply by passing the screen current through dropping resistor R-201, with condenser C-206 acting as an additional hum filter for the screen supply. To improve the voltage regulation of this screen supply, a neon tube V-201 is employed as a regulator tube. Bias and microphone voltage is obtained across resistor R-202 with L-203 and C-201 acting as R. F. choke and R. F. by-pass condenser respectively.

SECTION IV
MAINTENANCE

1. VIBRATOR REPLACEMENT.

The vibrator should be replaced after approximately one hundred hours of actual operation. The vibrator can be removed from the power supply case without removing any of the housing covers, by inserting a screw driver through the hole provided on the side of the case adjacent to the vibrator socket, and prying the vibrator up and out of its socket through the opening in the top of the power supply case (See Figure 4-1). The power supply must be turned "Off" before removing the vibrator; if this precaution is not observed, the vibrator plug prongs may be short-circuited causing failure.

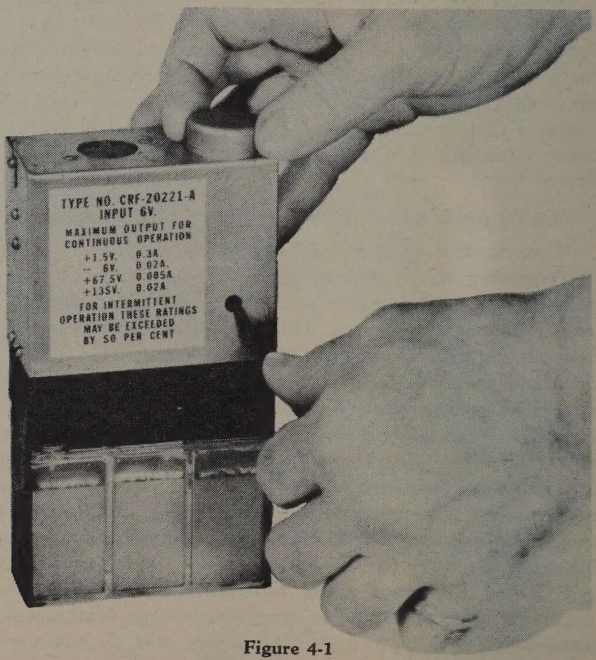


Figure 4-1
Vibrator Replacement. See Sec. 4, Par. 1

The vibrator may be checked at any time to see that it is in good operating condition by determining whether or not it will start with a discharged battery (approximately 5 volts). With such a battery, when the "Off-On" switch of the radio equipment is operated several times "on" and "off," the vibrator should start each time. If the relay closes but the vibrator does not start, the vibrator should be replaced.

2. CHECKING THE VIBRATOR POWER SUPPLY.

If a radio transmitting-receiving equipment known to be in good working condition is available, it may be determined by the substitution method whether or not the power supply is operating properly. This test is performed by operating the radio equipment which is known to be satisfactory with the power supply in question. If the radio equipment performs satisfactorily, the power supply is in good working condition.

In order to test the power supply output voltages independently of the transmitter-receiver, it is necessary to provide a 5 prong test plug identical to the one in the top of the radio case and connected as shown below (Figure 4-2). All resistors should be of ten watt minimum capacity in order that the resistance value will not change under load.

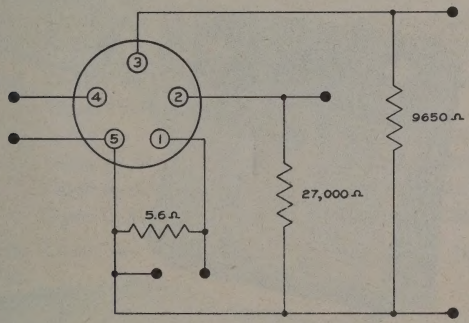


Figure 4-2

Top View of Test Plug.

Connect Meter Between	Voltage Reading
1 and 4	6 v. Bias
1 and 5	1.4 v. Filament
5 and 2	135 v. B+ Plate
5 and 3	67.5 v. B+ Screen

If these voltages are not observed, see paragraph 4.

3. BATTERY MAINTENANCE.

The Type 19042 battery requires no maintenance, since it is discarded when discharged and replaced with a fresh battery. When the Type 19046 battery is used, it must be recharged promptly following each discharge. It should be charged at a rate of ½ ampere for a maximum of 16 hours. If the electrolyte level drops during charge, distilled water should be added to restore the "Operating Level" as marked on the battery case. Never fill above this operating level. AFTER THE BATTERY HAS BEEN CHARGED, WAIT ONE HOUR BEFORE INSTALLING IT IN THE RADIO CASE TO ALLOW TIME FOR THE DISSIPATION OF GASSES. KEEP THE BATTERY CHARGED AT ALL TIMES. ALLOWING IT TO STAND IN A DISCHARGED CONDITION WILL RENDER IT INOPERATIVE.

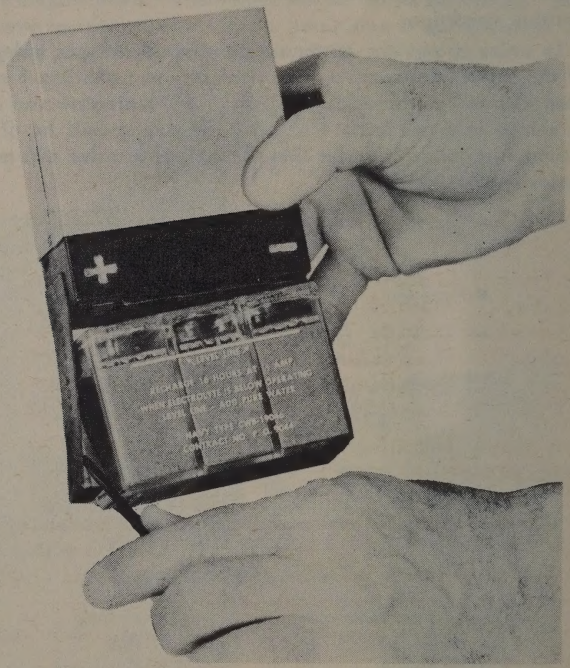


Figure 4-3

Removal of Battery. Insert screw driver at bottom edge of clamp as shown and pry clamp outward from battery.

4. TROUBLE SHOOTING.

When failure is encountered, use the test plug described in paragraph 2 and check the following in the order given.

Trouble	Probable Causes	Remedy
No Voltages	Discharged Battery	Replace Battery
	Poor Battery Connection	Clean and Adjust Spring Contacts and Battery Terminals
No 1.4 v.	Open Relay Coil K-201	Replace Relay K-201
	Shorted C-203	Replace C-203
No 135 v.	Defective Vibrator Y-201	Replace Vibrator Y-201
	Defective Relay Contacts K-201	Clean and Adjust Contacts or Replace Relay K-201
	Shorted C-204	Replace C-204
	Shorted C-205	Replace C-205
	Open L-202	Replace L-202
	Open Center Tap L-201	Replace L-201
	Open R-202	Replace R-202
135 v. but No 67.5 v.	Open R-201	Replace R-201
	Shorted C-206	Replace C-206
1.4 v. Normal but 135 v., 67.5 v. and 6.0 v. Low	Defective Vibrator Y-201	Replace Y-201
	Open Half of Secondary L-201	Replace L-201
	Open or Shorted C-207	Replace C-207
	Open R-203	Replace R-203
	Open C-205	Replace C-205
67.5 v. Supply Exceeds 80 v.	Defective V-201	Replace V-201

If the unit under test has an abnormally large amount of "hash" check C-201 and C-202 for open circuit. Make sure that a good electrical connection is made between the R. F. shield (E-201), the power supply and the transmitter-receiver unit.

If the unit has a high amount of hum, check all electrolytic capacitors for open circuit.

Note

Some variation in "hash" and hum will be noted between transmitter-receivers and between power supplies.

5. DISASSEMBLY.

Access to a number of the power supply components will be obtained by removing the front cover of the power supply. However, transformer (L-201), choke (L-202) and condenser (C-202) are potted in one container in the lower part of the power supply, so that it is necessary to replace the entire unit in the event of failure of any of these components. Further, a special procedure is required for obtaining access to condensers C-201, C-204, C-205 and C-206 for replacement. The procedure to be followed is outlined below (See Figure 4-4, 4-5, and 4-6).

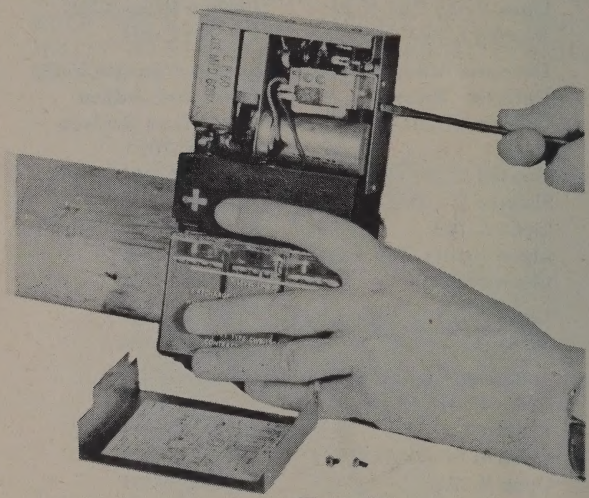


Figure 4-4
Disassembly of Front Cover and Relay. See Sec. 4, Par. 5.

(a) Remove cover by removing two screws that hold cover in place.

(b) Carefully unsolder and disconnect the yellow wire and the black spaghetti-covered wire which are connected to the neon bulb assembly.

(c) Remove the two screws holding the relay and neon bulb assembly. Take out neon bulb assembly and pull relay aside.

(d) Carefully unsolder and disconnect the following wires which pass through the grommet in the shield partition:

(1) Black spaghetti-covered wire which is connected to socket terminal No. 4.

(2) Shielded wire connected to socket terminals No. 1 and No. 5.

(e) Remove the two screws holding housing to base assembly.

(f) The top portion of housing assembly may then be pushed back which will expose to view condensers C-201, C-204, C-205 and C-206.

Note

When repairing the power supply, the following precaution should be observed. Keep the battery out of contact with soldering irons and other hot objects, since otherwise serious damage to the battery case will result.

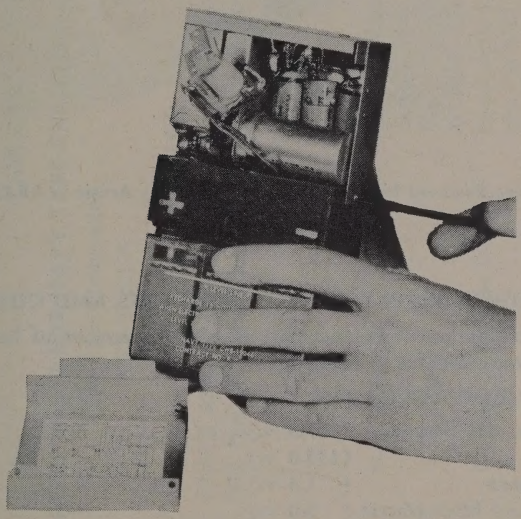


Figure 4-5

Disassembly of Housing from Base Assembly. Neon Tube Assembly has been removed and relay has been pulled aside. See Sec. 4, Par. 5.

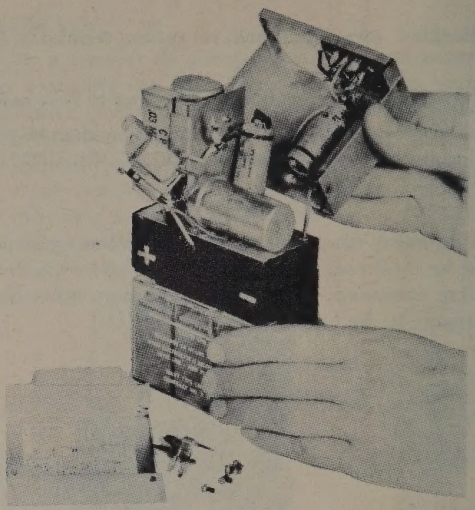


Figure 4-6

Housing Removed from Base Assembly Allowing Access to All Components. See Sec. 4, Par. 5.

6. POWER SUPPLY OUTPUT VOLTAGES AND CURRENTS.

A tabulation of the normal power requirements of both receiver and transmitter is as follows:

RECEIVER SECTION.

Plates and Screens	(67.5 v.)	3.0 MA
	(135.0 v.)	4.0 MA
Filaments	(1.4 v.)	225.0 MA
Bias and Microphone	(6.0 v.)	0.0 MA

TRANSMITTER SECTION

Plates and Screens	(67.5 v.)	1.5 MA
	(135.0 v.)	19.0 MA
Filaments	(1.4 v.)	225.0 MA
Bias and Microphone	(6.0 v.)	30.0 MA

These voltages and currents may vary from the nominal values over relatively wide limits due to variations in power requirements between transmitter-receiver units and changing primary battery internal resistance.

SECTION V
PARTS AND SPARE PARTS LISTS

TABLE 1

LIST OF MAJOR UNITS FOR NAVY TYPE CRF-20221-A VIBRATOR POWER SUPPLY

Symbol Group	Navy Type Designation	Name of Major Unit	Assembly Drawing No.
201-299	CRF-20221-A	Vibrator Power Supply	

TABLE 2

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION FOR NAVY TYPE CRF-20221-A VIBRATOR POWER SUPPLY

Symbol Desig.	Quantity Mobile Spares	Function	Description	Mfr.	Mfr. Desig.	Contractor's Drawing and Part No.
			Capacitors			
C-201	2	R. F. Bypass	Paper Capacitor .1 Mfd., 200 v. DCW	4	CP-89	CP-89
C-202	★	R. F. Bypass	Paper Capacitor .05 Mfd., 100 v. DCW	10	TT-6-A	CP-68
C-203	4	Fil. and Mic. Hum Filter	Electrolytic Cap. 200-350 Mfd., 6 v. DCW	5	D-9227	CE-24

★C-202, L-201, L-202, and X-201 form an assembly. Three (3) spare assemblies furnished.

TABLE 2 (Continued)

Symbol Desig.	Quantity Mobile Spares	Function	Description	Mfr.	Mfr. Desig.	Contractor's Drawing and Part No.
C-204	4	Plate Hum Filter	Electrolytic Cap. 12 Mfd., 150 v. DCW	5	D-9230E	CE-30
C-205	4	+B Hum Filter	Electrolytic Cap. 12 Mfd., 150 v. DCW	5	D-9230E	CE-30
C-206	4	Screen Hum Filter	Electrolytic Cap. 12 Mfd., 150 v. DCW	5	D-9230E	SA-150
C-207	5	Vibrator Buffer Capacitor	Paper Capacitor .03 Mfd., 600 v. DCW	4	CP-60	CP-60
			Miscellaneous Electrical Parts			
E-201		R. F. Shield	Formed Metal Shield Plate	1	MP-199	MP-199
			Screws			
H-201	12	Holding Piece	#3-48 x 5/16" R.H.M.S.	9		SM-49-3
H-202	12	Holding Piece	#3-48 x 3/16" R.H.M.S.	9		SM-48-3
H-203	12	Holding Piece	#2-56 x 3/16" F.H.M.S.	9		SM-47-3

★C-202, L-201, L-202, and X-201 form an assembly. Three (3) spare assemblies furnished.

Symbol Desig.	Quantity Mobile Spares	Function	Description	Mfr.	Mfr. Desig.	Contractor's Drawing and Part No.
			Mounting Bracket and Terminal Strip Assembly			
H-204	2	Holding Piece	Mounting Bracket and Terminal Strip Assembly	1	MB-44-A	MB-44-A
			Relay			
K-201	5	On-Off Switch	S.P.S.T., norm. open, 17 ohm coil	3	A14269	RS-1
			Inductors			
L-201	★	Power Transformer	Transformer, Power	12	LI-99	LI-99
L-202	★	B+ Audio Choke	Inductor, Filter (600 ohms)	11	AB-5038	LI-109
L-203		Bias Choke	Choke Radio-frequency	1	LA-14A	LA-14A
			Resistors			
R-201	5	Screen Voltage Dropping	Carbon Res., 12,000 ohm, ±5%, 1 watt	6	BT-1	RC-6
R-202	5	Bias	Carbon Res., 500 ohm, ±20%, ½ watt	13	SCI-½	RC-18

★C-202, L-201, L-202, and X-201 form an assembly. Three (3) spare assemblies furnished.

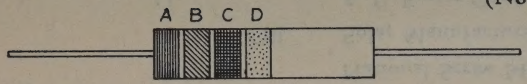
TABLE 2 (Continued)

Symbol Desig.	Quantity Mobile Spares	Function	Description	Mfr.	Mfr. Desig.	Contractor's Drawing and Part No.
			Resistors (Continued)			
R-203	5	R. F. Suppressor	Carbon Res., 10,000 ohm, ±20%, ½ watt	13	SCI-½	RC-17
			Neon Tube			
V-201	5	Voltage Regulator	Neon Tube	2	NE-2	TG-1
			Sockets			
X-201	★	Vibrator Socket	6-prong Vibrator Socket	7	SW-6	SW-6
X-202	2	Output Socket	5-prong Output Socket	8	F-125	SW-7
			Vibrator			
Y-201	20	Interrupter and Rectifier	Split-Reed Synchronous Vib.	1	VR-2	VR-2

★C-202, L-201, L-202, and X-201 form an assembly. Three (3) spare assemblies furnished.

TABLE 3

R. M. A. STANDARD COLOR CODE FOR RESISTORS IN OHMS FOR NAVY TYPE CRF-20221-A VIBRATOR POWER SUPPLY



(No color coded capacitors are used in Vibrator Power Supply CRF-20221-A.)

A—Color for 1st significant figure.
B—Color for 2nd significant figure.
C—Color for No. of ciphers of multiplier.
D—Gold or silver indicate tolerance, when applied.

Color	Significant Figure	Multiplying Value
Black	0	1
Brown	1	10
Red	2	100
Orange	3	1,000
Yellow	4	10,000
Green	5	100,000
Blue	6	1,000,000

Color	Significant Figure	Multiplying Value
Violet	7	10,000,000
Gray	8	100,000,000
White	9	1,000,000,000
Gold	5% Tolerance	0.1
Silver	10% Tolerance	0.01
No Color	20% Tolerance	

EXAMPLES

50,000 Ohms	Green	(5)	Black	(0)	Orange	(x1000)
3,500 Ohms	Orange	(3)	Green	(5)	Red	(x100)
50 Ohms	Green	(5)	Black	(0)	Black	(x0)

TABLE 4

LIST OF MANUFACTURERS

Code No.	Mfr. Prefix	Name	Address
1	CRF	The Radiart Corporation	Cleveland, Ohio
2	CG	General Electric Company	Schenectady, New York
3	CRY	C. P. Clare & Company	Chicago, Illinois
4	CPC	The Potter Company	Chicago, Illinois
5	CSF	Sprague Electric Company	North Adams, Mass.
6	CIR	International Resistance Corp.	Philadelphia, Pa.
7	CFK	A. W. Franklin Mfg. Corporation	New York, New York
8	CMG	Cinch Manufacturing Company	Chicago, Illinois
9		National Screw Machine Products Association	Cleveland, Ohio
10	CSL	Solar Manufacturing Corp.	New York, New York
11		A. P. Foster Company	Lockland, Ohio
12		The Rola Company	Cleveland, Ohio
13		Speer Resistor Corp.	St. Marys, Pa.
14	CWB	Willard Storage Battery Co.	Cleveland, Ohio

Figure 6-1
Schematic Diagram.